GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT INITIATION

Date: Jan. 21, 1969

Project Title: Microwave and Antenna Research

Project No.: A-1145 (And Related Nos.)

Project Director: Dr. R. C. Johnson

Sponsor: Scientific-Atlanta, Inc.

Effective 1-16-69 Estimated to run until: 1-15-70

Type Agreement: Standard Industrial Amount: $ 6,000.00*

*Total amount not to be exceeded - individual work requests will be defined, estimated, and budgeted separately using project sub-numbers.

Reports: As appropriate

Contact Person: Mr. George W. Ray, Jr.**
Manager of Purchasing
Scientific-Atlanta, Inc.
P. O. Box 13654
Atlanta, Ga. 30324

**Only person authorized to initiate or change individual work requests for sponsor.

Assigned to Electronics Division

COPIES TO:

- ☐ Project Director
- ☐ Director
- ☐ Associate Director
- ☐ Assistant Director(s)
- ☐ Division Chiefs
- ☐ Branch Head
- ☐ General Office Services
- ☑ Engineering Design Services
- ☐ Photographic Laboratory
- ☑ Research Security Officer
- ☐ Accounting
- ☐ Purchasing
- ☐ Report Section
- ☐ Library
- ☐ Rich Electronic Computer Center
- ☐ _____

Reports
300. A-1145

A-1145

19

GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
225 North Avenue, Northwest · Atlanta, Georgia 30332

24 February 1969

Mr. Gerald Hickman
Scientific-Atlanta, Inc.
P. O. Box 13654
Atlanta, Georgia 30324

Subject: Considerations of Compact Antenna Ranges for Testing Navy Radar Antennas

Reference: EES Project A-1145-001

Dear Mr. Hickman:

This letter will summarize the results of a brief investigation to determine the feasibility of using compact antenna ranges for testing Navy radar antennas; the investigation was conducted during January and February of this year. The efforts included a meeting at Georgia Tech on 12 February with representatives from Georgia Tech, Scientific-Atlanta, and the Navy to discuss compact ranges and to illustrate their operation.

From the data you furnished, it appears that all of the antennas to be considered have characteristics which fall within the following bounds:

Frequencies	X-band and K_u-band	
Polarizations	H, V, RC, LC, and rotating linear	
Sizes	Paraboloids	14.5 to 36 inches diameter
	Array	48 by 6 inches
Beamwidths	Paraboloids	2.2° to 7°
	Array	1.5° by 14° shaped

In addition, boresight capabilities are required for the paraboloids.

To test antennas with the above characteristics, I suggest a point-source range configuration consisting of a section of a paraboloid with an offset feed. The reflecting area should be about 12 by 12 feet, and the focal length should be about 8 feet. To control stray radiation, particularly at K_u-band, the reflecting surface should conform to a true paraboloidal surface within about ±0.010 inch (as a goal) over most of the surface. I recommend that the reflector edges be "rolled" with a radius of about 6 inches to reduce edge effects and stray radiation. Such a range is illustrated schematically in

Figure 1. For boresight alignment, I suggest a telescoping periscope as discussed at Georgia Tech during our meeting on 12 February.

The selections of the above parameters for the point-source range were based on our previous experience at Georgia Tech with compact ranges. Although additional studies would be desirable, I feel intuitively that the above selections are reasonable. I believe that the maximum stray radiation levels will be generally below -40 dB with respect to the collimated energy.

Please remember that considerable efforts must be devoted (1) to the mechanical design of the reflector and supports, (2) to the design of feed configurations, and (3) to the design of the telescoping periscope for a boresight reference. Each design problem, however, is solvable in a straightforward manner.

As you realize from our discussions, the first such compact range is expensive because of design and tooling costs, but succeeding ranges of the same model will be much cheaper. Such a range should prove to be economical in a facility which has a large number of antennas to test annually.

I believe that the submission of this letter concludes the needs for our services on the feasibility study. Let me know if we can be of further service.

Very truly yours,

R. C. Johnson
Chief, Electronics Division

RCJ:vp

Enclosure

cc: (1) GTRI
(2) A-1145-001 Division File

bcc: HAE
RMG
RAM

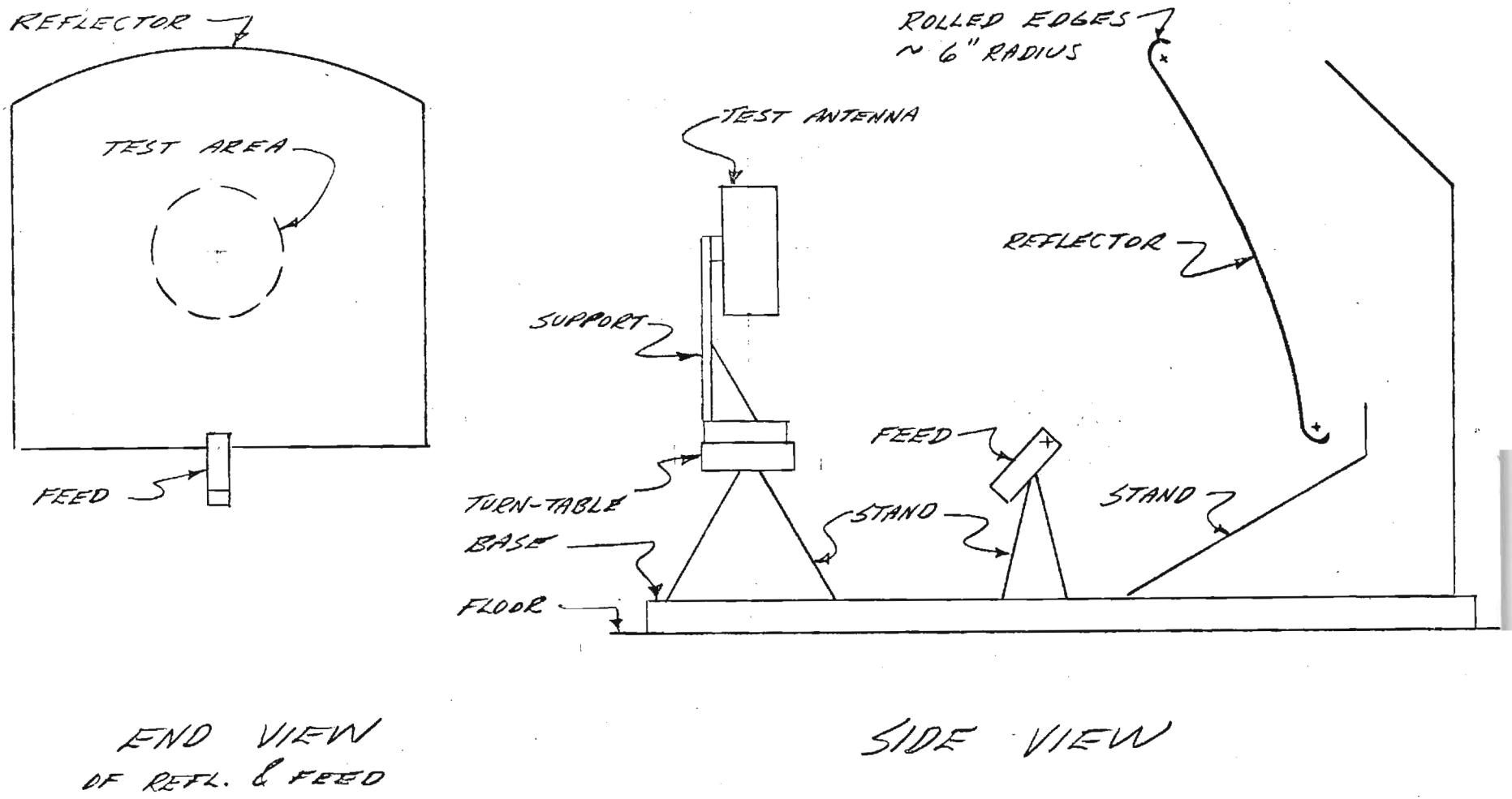

Figure 1. Schematic illustration of compact antenna range. Alignment device for boresiting is not indicated in the sketch.

A-1145

GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION

225 North Avenue, Northwest · Atlanta, Georgia 30332

18 July 1969

Mr. Trent Davis
Scientific-Atlanta, Inc.
P. O. Box 13654
Atlanta, Georgia 30324

Subject: Assistance Provided in Conducting CORTS Interference Susceptibility Tests on a Monoscan Converter

Reference: EES Project A-1145-003

Dear Mr. Davis:

This letter summarizes the work done to date by Georgia Tech for Scientific-Atlanta on the CORTS Interference Susceptibility Tests on a Monoscan Converter. This effort, which was accomplished under Georgia Tech Research Project A-1145-003, provided Scientific-Atlanta with consulting services, simulated radar signals, and use of testing facilities.

The simulated radar signals were generated by high-power pulsed magnetrons operating in L, S and C-bands. The L-band magnetron was tunable from 1220-1350 MHz, the S-band magnetron had a fixed frequency of oscillation of 2736 MHz and the C-band magnetron was tunable from 5400-5850 MHz. The pulse widths at all frequencies were 1.9 μsec and the repetition rate was always 550 pulses per second synchronized with the switching of the Monoscan Converter. The high peak powers produced by the magnetrons were attenuated to levels suitable for the tests; peak powers were continuously variable from less than 0.1 watt to greater than 1 kW.

The first tests were conducted on Thursday, 3 July 1969. These tests were conducted by Trent Davis and Mac McMichaels of Scientific-Atlanta, with the assistance of George Ewell and Pat Burns of Georgia Tech. The equipment was set up, proper functioning of the equipment was verified and testing was conducted to one watt peak power at L-band. These preliminary tests were continued on Monday, 7 July 1969, with peak powers of up to one watt applied to the Monoscan Converter at L-, S- and C-bands.

On Tuesday, 8 July 1969, the experimental setup was inspected and testing was repeated to one watt peak power at L-band. Personnel present at the inspection were George Ewell and Pat Burns of Georgia Tech, Mac McMichaels and Trent Davis of Scientific-Atlanta, T. O. Stiling of Mitre

Corp. and W. C. Vernon of Service Technology Corp.

Extensive testing of the Monoscan Converter was performed on Thursday, 10 July 1969 and Friday, 11 July 1969. Those present for these tests were George Ewell and Pat Burns of Georgia Tech, Trent Davis and Mac McMichaels of Scientific-Atlanta, D. E. Kendall and T. O. Stiling of Mitre Corp. and W. C. Vernon of Service Technology Corporation. The specific frequencies chosen for these tests were 1350 MHz, 2736 MHz and 5610 MHz. During these two days peak powers were gradually increased to 100 watts peak at each of the test frequencies. Although Georgia Tech provided consulting services, personnel, simulated radar signals and test equipment for these tests, the official measurements on the Monoscan Converter and evaluation of its performance were performed by the representatives of Scientific-Atlanta.

It is understood that the performance of these tests fulfills the need for consulting services and assistance required by Scientific-Atlanta under project A-1145-003. If any further testing of the Monoscan Converter is indicated, the experience and facilities acquired by Georgia Tech during these tests would permit timely and efficient completion of such testing. If we may be of any further assistance, please feel free to contact us.

Respectfully Submitted,

for George W. Ewell
Project Director

Approved:

H. A. Ecker
Head, Radar Branch

GWE:sp